Session III: Political steering instruments in the EU

Finnish perspective

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Contents

- Some starting points and statistics
- Regulatory framework and recent policy development on contaminated land management (CLM)
- Summary

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Recent national policy approach

- Circular (bio)economy and clean solutions strategic policy goals (at least in the previous Finnish Goverment Programme)
  - 26 key projects including CLM
  - Political will -> possibilities for a change
- Public administration trying to manage transition – from policy objectives to policy implementation and operational practice
  - Improving and developing the regulatory framework
  - Increasing knowledge by research, demonstrations, education etc.
  - Improving management approaches (public and private), incl. administrative processes, economic instruments, procurement procedures, data systems, business development, technological innovations, voluntary agreements etc.
  - Fostering commitment and cross-sectoral cooperation by open dialogue and joint actions

→ **As many challenges will remain in such transition, the regulatory policy and measures should be explicit, consistent and predictable**

- Deviating sectoral objectives and approaches (e.g. in waste management) is a challenge
- In addition, political objectives do not always match with personal/institutional attitudes...

Finland, a land of solutions

Strategic Programme of
Prime Minister Juha Sipilä's Government
29 May 2015

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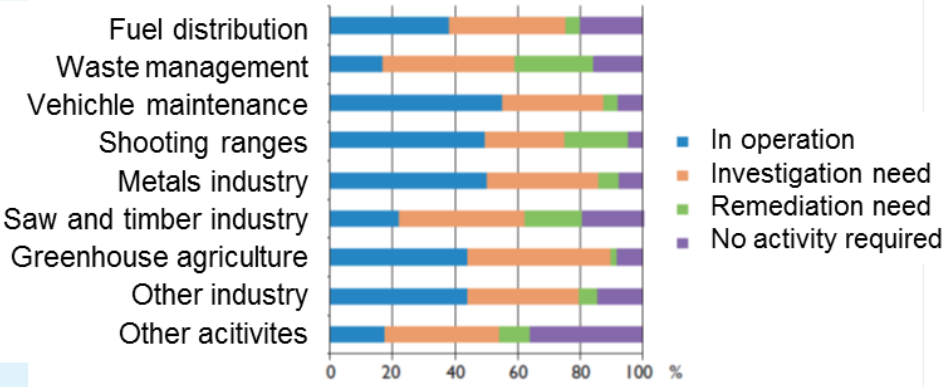
STARTING POINTS

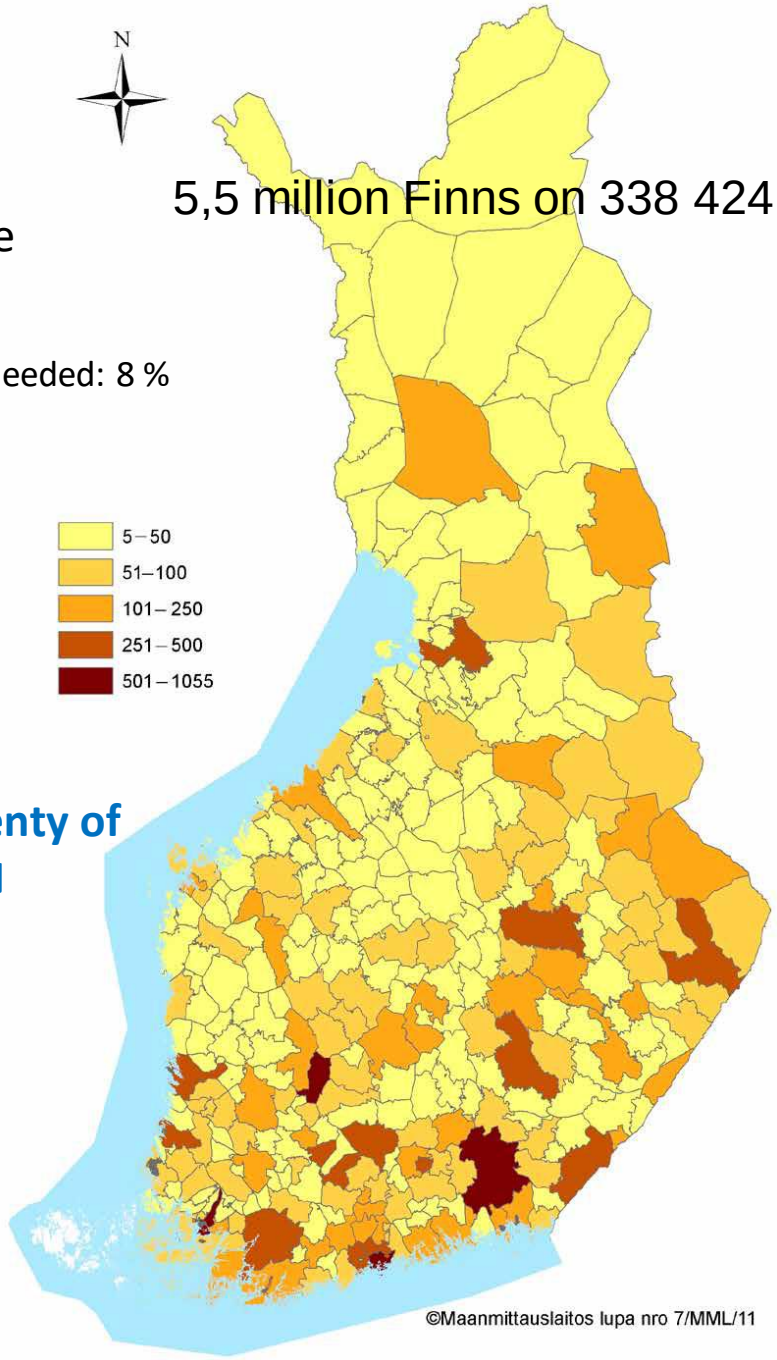
SITE STATISTICS

- > 27 000 sites in the soil state database
  - Operational sites: 33 %
  - Historical sites, investigations needed: 31 %
  - Historical sites, assessment or remediation needed: 8 %
  - Remediated (no remediation needed): 27 %

- Ownership/occupancy
  - Private persons: 36 %
  - Companies/operators: 30 %
  - Municipalities: 25 %
  - State (or no data): 9 %

→ **Landuse pressure varies regionally, plenty of available land/soil in most parts of FIN**



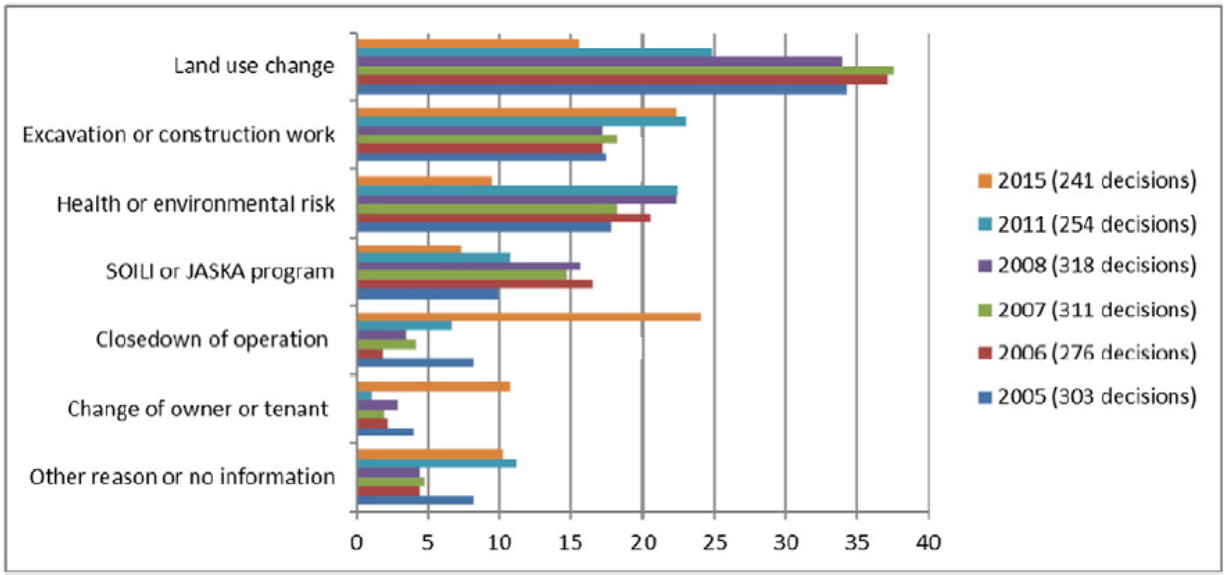


STARTING POINTS

SITE REMEDIATION STATISTICS

- About 6500 sites remediated, about 250 new cases start annually
  - Still ~ 90% of sites remediated by excavation using soil guideline values used remediation goals
- Land use change and construction works main triggers for a CLM project
  - Affects remediation methods and objectives -> favors excavation and guideline values
- Total annual costs around 100 M€ (?)
  - Current share: 2/3 private sector, 1/3 public sector
- Direct state financing on average only 5 M€/year
  - Mainly by two national remediation programmes (orphan sites and oil contaminated sites)
  - State-owned organizations also spend several million € annually (e.g. defence forces)

→ **Rather small and mostly market-driven remediation industry**



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STARTING POINTS

SOIL MANAGEMENT

- Surplus soils from construction sector in total 20-30 Mt/a
  - Even 10 times more than municipal waste (2,4-2,8 Mt/a)
  - Contaminated soil (C > SGV) around 1,5 Mt/a
  - Surplus soil often regarded as waste -> treatment and reuse requires environmental permit

- Due to permit obligation, excavated ”soil waste” disposed/reused mainly in landfills (contaminated) or specific soil landfills (uncontaminated)
  - Use of virgin soil/rock; long transportation distances -> high C02 emissions; high costs etc.

→ **From sustainability viewpoint, efficient soil management is the key issue**

Petri Heino

REGULATION OF CONTAMINATION

- Environmental Protection Act (EPA 86/2000 -> 527/2014)
  - Regulation of contamination integrated under one law
  - Promotion of pollution prevention, sustainability, public participation etc.
  - Contamination refers to anthropogenic emissions that cause harm to human health or the environment

- Regarding contaminated land EPA defines, e.g.
  - Prohibitions for soil and groundwater contamination -> prevention
  - Duties to notify, investigate, assess and clean-up contaminated soil and groundwater
  - Liabilities
    - 1. polluter, 2. site holder/owner, 3. local municipality
  - Required administrative actions for remediation
  - Duty to report on all activities relating to known/potential contamination within land transfer
  - Specific requirements for IED installations (e.g. baseline report)

- Decree on the Assessment of Soil Contamination and Remediation Needs
  - General requirements for obligatory site-specific risk assessment
  - Including threshold and guideline values (SGVs not legally binding); replacing the old values (1994)

→ **Risk-based approach needed for decision making (risk management)**
  - Same rules (in principle) apply to both old and new contamination

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Recent and forthcoming policy development

- Contaminated land management, e.g.
  - New guidelines on risk assessment and sustainable risk management (2014)
  - National CLM strategy (2015)
  - National investigation and remediation programme 'Clean Soil' (2016 ->)
  - Demonstration project on innovative site management solutions (2016-2018)
  - New act on state funding for remediation (2020)
  - Revision of the decree on risk assessment (in prep. 2020?)

- Soil and waste management, e.g.
  - Revised decree on utilization of certain wastes in earth construction (2018)
  - Decree on beneficial use (=reuse) of excavated soil waste from construction (in prep. 2020?)
  - EoW-Decree on using crushed concrete in earth construction (in prep. 2020)
  - EoW-Decree on using treated MSWI BA in concrete products (in prep. 2020?)

→ **Promoting sustainable, risk-based decision making and fostering circular economy by**

- **introducing new policy objectives and instruments**
- **removing existing regulatory barriers**

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GOVERNING REGULATORY PRINCIPLES

1) Justified site-specific risk assessment

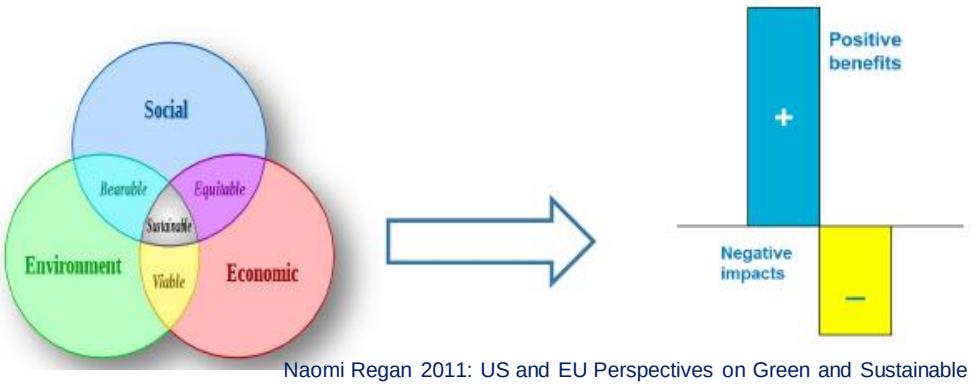
- Reliable (realistic) estimate of site-specific risks/harms -> requirements directly from the legislation
- Main question: Is remediation really necessary based on environmental and health risks?
  - Direct use of generic SGVs often neglects actual risks (and may even underestimate them)
  - Concentration-based decision making often promotes unnecessary or unsustainable remediation

→ **Precondition to reasonable, risk-based decision making and actions**

2) Sustainable risk management and remediation

- No direct legal requirements, but widely accepted policy objective in guidelines, strategies etc.
- Requires proactive planning and open dialogue / cooperation between key stakeholders
- Selecting the most reasonable measures by optimizing their environmental, economic and social value -> sustainability appraisal

→ **Providing necessary risk reduction on site while maximizing the net-benefits of risk management actions**



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Naomi Regan 2011: US and EU Perspectives on Green and Sustainable Remediation

Finnish national strategy on CLM

- Setting policy goals
  - Systematic, sustainable and risk-based site management
- Indentifying needs and developing measures
  - Targeted policy instruments
- Promoting cooperation
  - Shared views and commitment

Main policy objective:
Significant risks to human health and the environment posed by contaminated land are managed in a sustainable way by the year 2040

Objective 1:
Risk sites are to be identified, investigated and, if necessary, remediated systematically.

Objective 2
Land use and risk management of contaminated land support each other in the achievement of sustainable, overarching solutions.

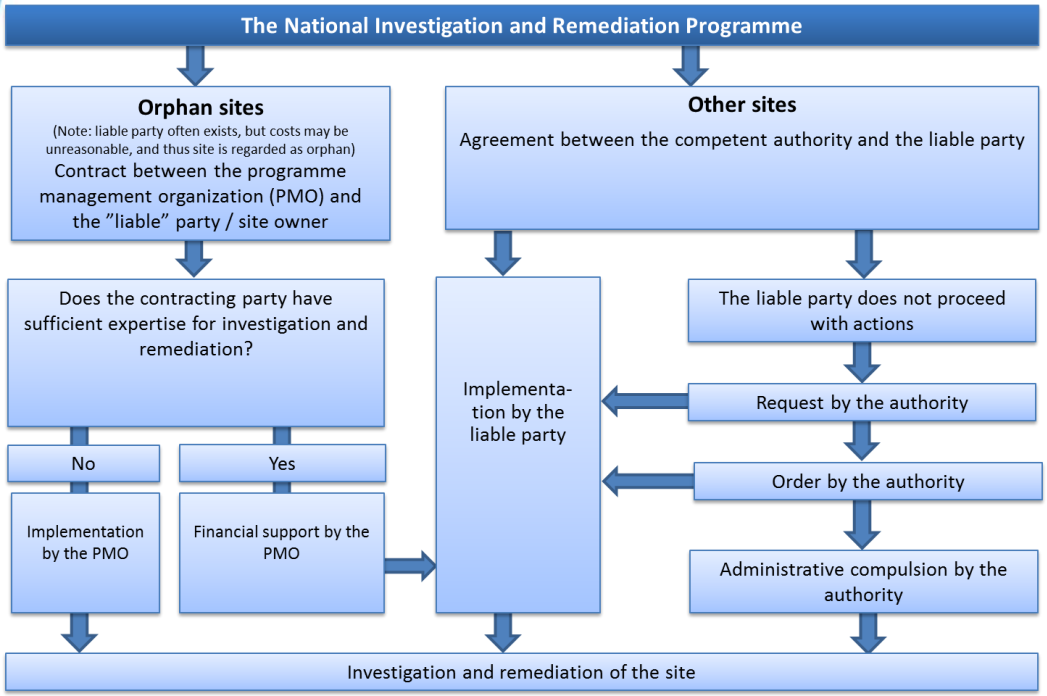
Objective 3:
Data systems are to support planning and decision making in a user-oriented way.

Objective 4
Risk management methods are cost effective, save natural resources, minimise harmful environmental impacts and promote circular economy.

Objective 5
Methods, division of work between the operators, responsibilities and obligations are to be clear and standardised.

Objective 6
Operations and communications are to be open, transparent and interactive.

National remediation programme
- clean soil



- In addition, two national programmes for oil contaminated sites
  - SOILI (1997-2016) and JASKA (2016 ->)
  - Voluntary agreement between Ministry of the Environment and Finnish petroleum industry
  - > 1000 sites investigated
  - > 700 sites remediated
  - Contribution to national development, e.g. on risk assessment and in situ remediation

- Programme management organization (PIR-ELY) takes care of "orphan" sites
  - Liable usually exist in FIN, but cost may be unreasonable
  - Site selection for the programme based on risk prioritization
  - Financial support from the state
- Requirements for actions and funding
  - Risk-based remediation need
  - Remedial design based on sustainability appraisal

SYKE

CONTAMINATED LAND DEMONSTRATION PROGRAM

CONTAMINATED SITES DEMONSTRATION PROGRAM

Finnish innovations for contaminated soil respond to global demand

Finland contains more than 27 000 sites that are known or suspected to be contaminated. More than 20 000 of the sites still await further investigation on the scale of contamination or the need for risk management and remediation. According to estimates, half of the sites are in need of risk management measures. Using traditional methods, this would result in a cost of approximately 4 billion euros. Based on similar estimations made elsewhere in Europe, in the United States and China, the global remediation of contaminated sites would induce a cost of at least a trillion euros.

We need new sustainable, advanced and cost-effective risk management and remediation solutions for contaminated soils in Finland and worldwide.

– To create such solutions, close and effective cooperation is needed. The National Risk Management Strategy for Contaminated Land in Finland, published in 2015, stresses the importance of thinking ahead and developing the cleantech field as a whole in order to effectively investigate and remediate sustainably the contaminated sites, explains **Jarno Laitinen**, Program Manager for the Finnish Contaminated Sites Demonstration Program at the Pirkanmaa ELY Centre.

These were the existing conditions at the beginning of 2016 when the Contaminated Sites Demonstration Program was launched as part of the Finnish government's Circular Economy and Clean Solutions strategic key project. The objective of the demonstration programme is to serve as a platform for solving problems related to the risk management and remediation of contaminated sites, to promote the circular economy, and to improve the competitive edge and potential for international business of Finnish cleantech companies. The implementation and financing of the demonstration programme are centrally managed by the Pirkanmaa Centre for Economic Development, Transport and the Environment (ELY Centre) and Business Finland.

Finland leads the way in soil risk management

The results from the demonstration programme speak for themselves. For two years, this nationally and internationally unique demonstration programme gave a boost to the experimentation, demonstration and communication activities related to contaminated land management – and with great success. Thanks for the results can be attributed to the companies and research institutions that participated in these projects. They boldly took up the development and testing of new techniques, ideas and business models as part of these massive and demanding cleaning projects, both domestically and worldwide.

– This acknowledgement must also be extended to the municipalities around Finland that had an open mind and adopted new and sustainable risk management measures in order to remediate challenging environmental risks on their brownfield sites as part of their land use planning. While developing methods and technology, we have also helped the environment and removed health risks related to contaminated land. Today, this benefits thousands of Finns, explains Laitinen.

Unique expertise for international markets

According to Jarno Laitinen, these great results will now also be made available to the rest of the world.

– A strong passion for cooperation is a Finnish trait in the remediation of contaminated land. Another welcome outcome from the demonstration programme is a strong and close-knit network of involved parties, from administration to research institutions and companies. This guarantees that we have the world's best knowledge and services when it comes to the global needs of remedying contaminated soil. Our expertise ranges from legislation, administration, research, risk assessment and technological operations models to concrete international-scale remediation and business expertise.

> "With the soil and groundwater remediation pilots implemented during the demonstration programme, health risks have been mitigated for over 100,000 people."

CONTAMINATED SITES DEMONSTRATION PROGRAM

2 yrs PROGRAM PERIOD 2016–2018	>20 COMPLETED PROJECTS
>50 COMPANIES AND RESEARCH INSTITUTIONS	>10 CONTAMINATED AREAS

LAUNCHED IN 2016, the Contaminated Sites Demonstration Program implements the National Risk Management Strategy for Contaminated Land in Finland, as part of the national Clean Soil Program. Implemented together with the Pirkanmaa Centre for Economic Development, Transport and the Environment and Business Finland, the demonstration programme is also a part of the Finnish government's Circular Economy and Clean Solutions strategic key project. The key project aims to promote the circular economy and improve the potential for the business and internationalisation of Finnish cleantech companies.

CLEAN SOIL PROGRAM

Finnish soil and groundwater risk-free by 2040

The Clean Soil program aims to secure safe soil and groundwater for all Finns. This national programme was established as a part of Finland's National Risk Management Strategy for Contaminated Land and it serves the needs of identifying, investigating and remediating urgent risk sites. The programme is coordinated and implemented by the Pirkanmaa Centre for Economic Development, Transport and the Environment. The purpose of the programme is to remediate contaminated sites with national interests so that the risks for people and the environment are sustainably managed by 2040.

Sites assessed and selected based on risk level – sustainability steers remediation methods

The Clean Soil program investigates and remedies contaminated risk sites in an established order of urgency. The programme has already identified approximately 500 significant contaminated areas. The remediation needs of these areas are examined through investigations and assessed on related risks. The measures to be taken depend on the site and its intended use. Alternatives include remediation, but also various other measures and risk management procedures. With sites to be remediated, methods are applied that follow the principles of the circular economy and are sustainable and cost effective.

Close cooperation and open communication both in Finland and in international arenas

The Clean Soil program offers its expertise and provides financing to support municipalities and land owners in carrying out successful investigations and remediation projects. To offer the best possible expertise and know-how, the programme works in close cooperation with the environmental administration, experts in the field, municipalities, companies and citizens alike. In addition the program actively participates in development projects, creates and applies best practices, and advances the use of sustainable risk management in contaminated land and the business of Finnish cleantech companies.

More information: www.cleansoil.fi
Kari Pyötsiä, Program manager,
Pirkanmaa ELY Centre

CLEAN SOIL

https://www.maaperakuntoon.fi

CLEAN SOIL FINLAND

CONTAMINATED SITES DEMONSTRATION PROGRAM REPORT

SOILI PROGRAMME

DETERMINED COOPERATION YIELDS POWERFUL RESULTS

Finland's contaminated land industry is based on strong cooperation network

Joint and voluntary action plans promote the development of soil remediation. For two decades, the SOILI Programme worked actively to clean up oil-contaminated soils in Finland. It involved the development of both procedures and research of remediation methods. Also the industry own umbrella organisation, The Finnish Society for Soil Investigation and Remediation (MUTKU), helps people and organisations to network and learn from each other's.

THE SOILI PROGRAMME has been a trailblazer in soil remediation. The programme has developed new working methods and processes and a cost-effective procedure for remedying contaminated sites at portfolio level. Another essential part of the programme was seminars and training events, as these enabled the various stakeholders to have an open and unprejudiced dialogue.

Based on a voluntary environmental agreement, the SOILI Programme remediated a total of 586 contaminated areas between 1997 and 2016. The programme covered petroleum stations and other outlets that were previously occupied by oil companies and either closed or due to be closed, along with orphan areas that had already been decommissioned. Other key outcomes from the programme included participation in the development of risk-based assessment of soil contamination and remediation in Finland and the development of the SOILIRISK risk assessment model.

The main parties in the SOILI programme were the Ministry of the Environment, the Association of Finnish Local and Regional Authorities, the Finnish Petroleum Federation, and member companies of the organisation that practised petroleum service station operations.

The programme was implemented by Oil Industry Service Centre Ltd in collaboration with the environmental authorities. Pöyry Finland Oy were in charge of project management services. Financing for the station chains, oil companies and the Finnish Oil Pollution Compensation Fund, managed by the Ministry of the Environment.

After the SOILI programme, the Ministry of the Environment and the Finnish Oil Pollution Compensation Fund established the JÄSKÄ programme, which continues the goals of the SOILI programme and applies the developed processes and procedures.

Association offers training and support

Contaminated sites research and practices are also developed by MUTKU, the Finnish Association for Soil Investigation and Remediation, founded in 2001. The association aims to improve the proficiency and cooperation of all parties operating in the field. It also serves as a link between the individuals and organisations involved.

The essential operations of the association includes providing training events and supporting contaminated land related research. The association organises excursions and educational visits on an annual basis, along with Finland's largest seminar on contaminated land areas, MUTKU-päivät. Every two years, MUTKU and its Nordic sister organisations also organise an international Nordrocs seminar that concentrates on contaminated soil, groundwater and sediments. MUTKU also supports theses, graduate projects and other research by annu-

DORANOVA OPENS DOORS TO THE CHINESE SOIL REMEDIATION MARKET

Productised solutions and strong references are key in cleantech export

In the spring of 2017, the Finnish company Doranova Oy secured a licensing and cooperation contract for soil and groundwater solutions in China. Worth millions of euros, the deal was reached thanks to the DoAct® CORE remediation equipment, which Doranova productised for export with the help of Business Finland and the demonstration programme. With support from the demonstration programme, Doranova is also piloting its direct injection solution DoAct® DIRECT, which supplements the company's export product line.

– SELLING EXPERTISE ALONE on an international scale is challenging. In the growing soil and groundwater remediation markets of China, Africa and Russia, a carefully productised package is an asset that we can use to introduce our two decades of remediation expertise to the markets, says **Pertu Mattila**, Head of Soil Remediation at Doranova.

DoAct® CORE in China

Patented by Doranova in 2016, the DoAct® CORE solution is the first modular remediation solution on the market that enables cost-efficient biological, chemical and physical soil and groundwater remediation. In Xinmi, China, DoAct® CORE is used to treat a batch of soil containing numerous harmful substances, such as lindane, DDT, DDE, DDD and benzene. The contaminated soil comes from the area of a former pesticide factory in the city of Zhengzhou.

Pursiala pilot proves the efficiency of the direct injection equipment

Some 15–20 per cent of Doranova's operations are focused on product development, which aims to bolster the international growth of the company with the help of four or five in-situ product families that support each other. The direct injection equipment piloted by Doranova at the Pursiala site of the Clean Soil Finland programme has yielded excellent results in the remediation of challenging soil types and structural layers. It has even sparked interest in China.

– The remediation efforts in Pursiala have demonstrated in practice the benefits of DoAct® DIRECT as a fast and efficient solution. For the first time, injection is possible into all soil types and structural layers such as till and, under rockfill layers, all the way to bedrock fractures. A solution of this kind is not yet globally available, which makes it an internationally appealing alternative for the remediation of industrial areas and artificially filled sites.

DORANOVA OY:

- Doranova Ltd was founded in 1995. Today it employs 20 environment professionals
- Two business domains: soil and groundwater remediation and biogas solutions
- The company has a strong focus on product development and it has applied for five different patents in the past two years
- In 2017, 80% of the company's turnover came from foreign exports

INCREASED EMPHASIS ON SOIL RE-USE

Urbanisation drives the need for soil remediation

New national remediation and demonstration programmes help to create national vision and share information on soil remediation for the public sector.

IN FINLAND, THE AUTHORITIES PROMOTE and grant permits for developing contaminated land areas. The most typical cases concern the zoning of brownfield areas for residential use.

"Most soil treatment is still carried out through soil excavation, but the trend is shifting more towards risk-based remediation. This means that the soil is investigated and conclusions are drawn on whether the contaminated soil causes environmental or health hazards. Possible measures are then mapped out to prevent or curb these risks," says Senior Inspector **Emmi Pajunen** from Pirkanmaa ELY Centre.

With urbanisation, construction projects have become more complex and have brought more challenges to municipalities. The City of Tampere has been interested to see how the programme advances.

"One of the reasons that the national Clean Soil programme is so important is that it harmonises procedures and operational models on a national level," says Real Estate Development Coordinator **Katariina Rauhala** from the City of Tampere.

Focus on investigations at zoning-stage

When making land use more efficient, soil and its use becomes increasingly important. Detailed investigations at zoning stage decreases financial risks and insecurity during construction.

Rauhala says that the City of Tampere applies mass balance calculations, where the soils excavated on site and their optimal relocation are systematically planned. In addition, the recovery of construction demolition materials is investigated for recycling purposes. This phenomenon is also familiar to Emmi Pajunen from the ELY Centre:

"The MARA decree concerning the recovery of certain wastes in earth construction took effect at the beginning of 2018 and increased the use of crushed concrete aggregate in urban areas. It is a welcome trend that waste is re-used close to the demolition site. This is one way to replace virgin materials and curb carbon dioxide emissions from transport," Emmi Pajunen notes.

Today, a sizeable share of contaminated soil from Tampere is taken to the collection points of Tampere Regional Solid Waste Management. Previously, contaminated waste was used for construction purposes at landfills, but now that the volume of other waste is decreasing, the landfills will not be able to solve the problem of contaminated land to the same extent as they have in the past.

"Two future trends will be on-site treatment and returning soil to construction use through the use of various soil banks or hotels," says **Elina Tiira** from Tampere Regional Solid Waste Management.

NATIONAL RISK MANAGEMENT STRATEGY FOR CONTAMINATED LAND 2015–2040

Finland applies sustainable solutions to land contamination risks

Finland drew up a National Risk Management Strategy for Contaminated Land (the "PIMA strategy") in 2015. A joint objective is to apply sustainable and cost-effective solutions for bringing the health and environmental risks related to contaminated land areas under control by 2040. Published by the Ministry of the Environment, the strategy was prepared in close cooperation with other Finnish stakeholders operating in the field.

IN ADDITION TO EXPRESSING the national mindset in the matter, the PIMA strategy lays down the general guidelines, objectives and division of labour for risk management and remediation operations. With the strategy, Finland now has a clearly defined national process that enables risk-based site prioritisation at national level.

"We made use of the expertise and vision of all the involved stakeholders when preparing the strategy. It harmonised and consolidated the work carried out in recent decades and provided us with joint guidelines for future actions. The common thread is sustainable remediation. The strategy also lays out the significance of risk-based assessment when selecting sites for investigation and remediation," says the chair of the strategy working group, Senior Environmental Adviser **Anna-Maija Pajukallio**.

Joint strategy serves everyone involved

A modern and extensive strategy serves all parties involved and promotes the interest of all Finns. The key impacts of the strategy are related to the promotion of health and environmental protection as well as increasing the efficiency of research and remediation of contaminated land areas and the way these operations are organised. The Ministry of the Environment actively follows up goal attainment – with the new strategy, several actions have been taken and statutes drafted in Finland.

"A good strategy adjusts to everyday needs." The goals cover various operations related to contaminated land areas, ranging from land use planning and data systems to risk management methods and communications. "We take active steps to monitor the development of the operational environment to ensure that the strategy also meets future needs – which may be different from those relevant today," Pajukallio notes.

▶ **Download "National risk management strategy for contaminated land in Finland": http://bit.ly/contlandstrat**

Efficient water remediation is being studied around Töölönlahti

The equipment developed by Eko Harden Technologies creates a variable electrical field that accelerates natural processes that decompose organic substances.

IN TÖÖLÖNLAHTI IN HELSINKI, a remediation study using electrokinetic oxidation technology is currently under way. The patented EKOGRID technology can be used to feed electricity into soil, groundwater or sediment. The weak electrical field created by the equipment is harmless to the biota, and the method enables treatment in a cost-efficient and sustainable way with a small material footprint. The method is already being used to treat contaminated soil in a number of countries. In Helsinki, however, it is being used in the seabed for the first time.

Those involved in the efforts in Töölönlahti are working to determine whether it is possible to accelerate the decomposition of harmful organic material and compact sludge to harden the bottom of the bay. The aim is to demonstrate that EKOGRID is an economic and ecological solution for eliminating contaminants from the seabed. Another goal is to determine whether EKOGRID also significantly reduces

The EKOGRID method was developed and is being sold by the environmental technology company Eko Harden Technologies. In Töölönlahti, the company is working together with Lemor Corporation Oy AB, the City of Helsinki and the Finnish Environment Institute.

The research is being funded by the national pilot programme for contaminated areas, Business Finland and the EU's H2020 programme.

Eko Harden Technologies has operated on all continents and it strives for growth in cooperation with oil spill response specialist Lemor. The national demonstration program provides Eko Harden Technologies with the opportunity to gain an excellent reference for the in-situ decomposition of hydrocarbons in seabed sediment. In the future, the EKOGRID method may be applied in ports or reservoirs, for example, where sediment compaction could help to postpone or entirely avoid dredging. The benefit

FACT:

- Eko Harden Technologies Oy is a Finnish cleantech company established in 2006
- The EKOGRID method patented by the company is already used in several countries to treat contaminated land areas
- The EKOGRID equipment creates a weak variable electrical field that accelerates the decomposition of harmful substances in the soil
- The goal of the Töölönlahti remediation study is to demonstrate that the method can also be used to rehabilitate sea areas, lakes and rivers
- The study aims to ensure the capability of the method to decompose harmful substances, such as oil and PAH compounds, in the sediment

SUMMARY

- Finnish policy strives for fostering sustainability and circular economy
  - Development of policy instrumets, promoting research, demonstrations, education, cooperation etc.
  - Actions needed on all levels of decision-making and from all stakeholders
  - Sectoral approaches and personal attitudes may not always reflect generic policy objectives...
- Finnish regulatory approach on CLM is a risk-based approach
  - Risk assessment should support justified decision making
    - → From conservative (unfounded/unrealistic) assessments to realistic assessment
    - → From concentration thresholds to site-specific, exposure and effects based assessments
  - Reality is often somewhat different and getting rid of the old habits and numbers isn't easy...
- Risk management should be about justified actions
  - Maximizing net-benefits by relevant sustainability considerations involving key stakeholders
  - Regulatory perspective may (and often should) not dictate the outcome
    - → Sustainable remediation ≠ risk-based remediation
  - Excavation ≠ unsustainable practice, but excavated soil management needs to be efficient and reasonable -> reuse / treat and reuse
- And most importantly...

→ **We fu***** made it to the European football championship 2020!!!**

SYKE

THANK YOU!

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