

# INSURE

Innovative Sustainable Remediation



How to deal with contaminated sites in the Baltic Sea region



EUROPEAN UNION  
European Regional Development Fund



LÄNSTYRELSEN  
ÖSTERGÖTLAND



Project meeting Riga 2016  
Photo: Jenny Hultgren

# INSURE

## About the project

The Innovative Sustainable Remediation project (INSURE) is an Interreg Central Baltic project running from September 2015 until August 2019. The project is a cooperation between seven partners from Sweden, Finland and Latvia;

- County Administrative Board of Östergötland, Sweden, Lead partner
- Motala Municipality, Sweden
- University of Helsinki, Finland
- The Latvian Environment, Geology and Meteorology Centre
- Vidzeme Planning Region, Latvia
- Valmiera City Council, Latvia
- Populus Group Oy, Finland (2015- 2018)

INSURE works to decrease the distribution of hazardous substances to the Baltic Sea. The project aims to make the remediation of the contaminated sites more frequent and sustainable.

Main focus areas;

- investigations and tests of sustainable remeditions in selected pilot areas
- developing methods for a more efficient handling of contaminated sites and thereby an increased remediation rate
- creating technical tools for better prioritization and visualization such as GIS, models and databases to support the work with contaminated sites

# CONTAMINATED SITES

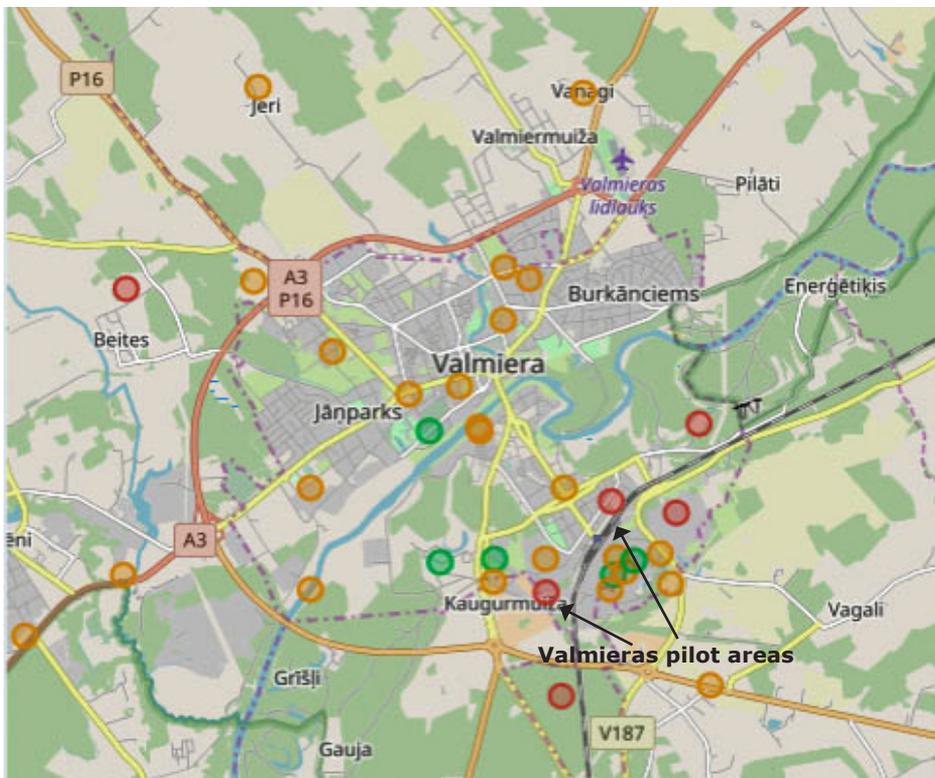
To be able to do something about the contaminated areas, we need to know their locations. Within INSURE, project partners in Latvia have developed a database to illustrate where the actually contaminated and the possibly contaminated sites might be.

In Sweden a similar database already exist. Municipalities have been able to try out the various systems.

Databases and mobile apps are publicly available and possible to open without any registrations.

*Databases aids actors to find the contaminated sites*

Figure:  
Database Latvian Environment Geology and Meteorology Center.  
Red areas: contaminated areas,  
orange: potentially contaminated,  
green: no contamination



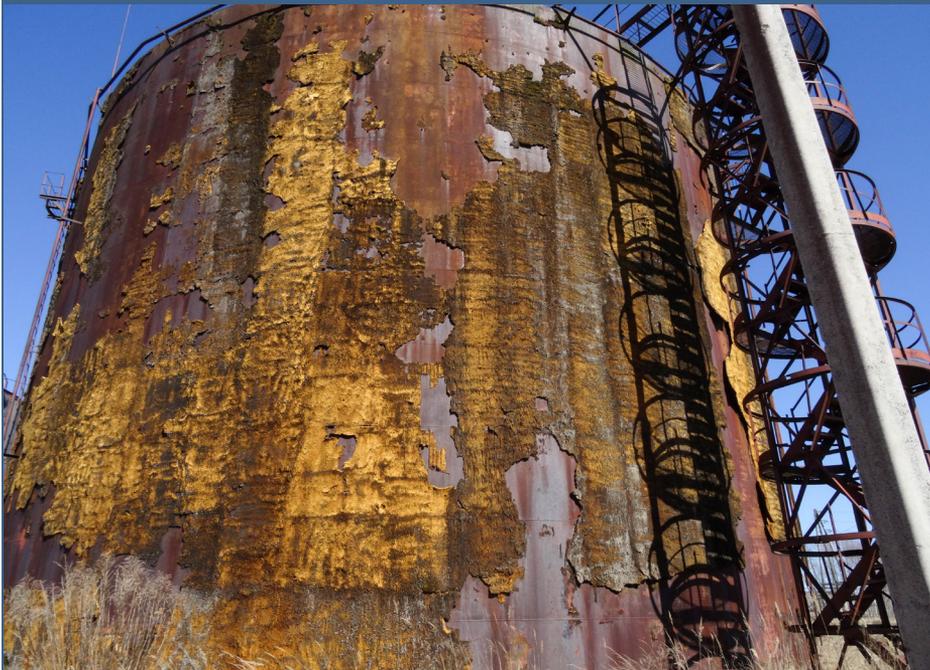
# MODELLING

## Developing systems

The Latvian Environment, Geology and Meteorology Centre together with Riga Technical University have developed the local hydrogeological model for the research on the groundwater contamination and its migration in the groundwater flow. The model base was extracted from the hydrogeological model of Latvia (LAMO4). The research site has been located at territory 9, Dzelzcela Street Valmiera.

It has been found out that contaminated groundwater may reach the River Gauja in 60 years. During the first 15 years, due to dilution, the concentration of contaminants drops 60 times. During this time period, intensive contaminant destruction may take place. Results of the hydrogeological modelling concludes that groundwater contamination has a slight influence to Valmieras City territory environmental quality.

Storage tank Valmiera. Photo: Magnus Kviele



# STRATEGIES

## To tackle contaminated sites

### COOPERATION

- Municipality
- Land owner
- Regional boards for environment

Cooperation is vital for succeeding in handling contaminated sites. Vidzeme Planning region has developed a strategy for this. The strategy recommends the handling of the contaminated and potentially contaminated sites based on a collaborative triangle: municipality, land owner and regional environmental boards. The recommendations are designed to allow informed decisions to be taken by the parties involved and none of the parties involved in the triangle would see the contaminated sites and their management as a boggle to be feared.

In Sweden we divide contaminated sites in 4 classes depending on the evaluated risk. A priority strategy is necessary, as there are many contaminated sites within each risk class and we can not work with them all at the same time. Examples of County Administrative Boards priority criteria are responsible party, vulnerability to natural disasters, impact on the environmental quality standards for water and presence of children. Motala municipality has made two action plans and they will among other things investigate 10 contaminated sites per year until 2025.



Seminar in Valmiera 2019. Vidzeme Planning region informs the local government development specialists, site planners, environmental specialists and Regional Environmental board about the strategy for handling contaminated sites. Photo: Māra Sproģe, Vidzeme Planning Region

# PLANS OF ACTION

Bring benefits to enterprises  
and supervisory authorities

## Self-monitoring

The plans of action are one tool for enterprises to continuously work with their contaminated sites, as a part of their self-monitoring. One of the benefits of working on action plans for contaminated sites is that they extend for several years and the companies can plan and prioritize when actions are going to be carried out.

## Supervision

In INSURE, one of the objectives has been to increase the proportion of remediations that are implemented with sustainable methods. The task of the supervisory authority is to ensure that the enterprise examine the possibility of using sustainable remediation methods.

**Within INSURE**, we have worked with implementing plans of action for how the enterprises in operation can handle contaminated sites. Both County administrative board of Östergötland and Motala Municipality have participated in the activity and in total we have selected 28 enterprises in operation. These have started to work with plans of action for their contaminated sites.

## Selecting enterprises

The enterprises represent different industries and it also differs on how far they have come with the work with contaminated sites. Some have done a lot of investigations and remediations and some have not even started with investigations of contaminated sites. These different conditions were an important part of the selection of enterprises that finally came to participate in the project.



**PLANS OF ACTION**  
– a tool for enterprises  
self-monitoring

## Recommendations

Things that the enterprises need to consider in their plans of action are:

- their own *organization* regarding contaminated sites
- scheduled and *planned* actions
- *prioritized* short-term and long-term remediation
- possibility to use *sustainable* remeditions

# REMEDIAL PROCESS

**Remediation** is needed when a building, a land or water area is contaminated to such a degree that it entails unacceptable risks for human health, the environment or natural resources.

Investigations and studies are used to gather data. The result can be compared with guidelines and limit values. It can also be used for risk assessment, remedial alternative selection process and risk valuation.

## Comparing values

In the INSURE project, we have compared limit and guideline values for contaminated sites between countries. In order to assess whether a contaminated site perform a risk, a risk assessment is usually made. It is based on scientific guideline or limit values of environment quality standards. There are differences between the countries. This is the case for both the numeric values for the same pollutants as well as legal status of guideline and limit values.

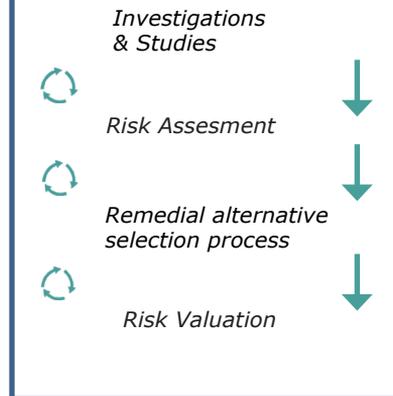
## Soil Structure or land use

In Latvia the soil structure is taken into account when deciding the country's limit and guideline values. In Sweden the land use is important when you decide the country's limit and guideline values.

**In Latvia** limit values are firmly established in national legislation, and foreign limit or guideline values can be used only in the case if there are no national limit values available.

**In Sweden** it is more common to use guideline values instead of limit values for soil. If there are no Swedish guideline values consultants can use other countries guideline or limit values for risk assessment. Before using guideline values it is important to consider if the value is applicable for the specific site.

FIGURE:  
Remedial process step-by-step,  
each discussed through workshops



Country/ Region	Pb Lead	Zn Zinc	Oil Products sum
Latvia	13-500	16-700	1- 5000
Sweden	50-400	250-500	3- 1000

Comparison of EQS limit or guideline value intervals for heavy metals and for organic pollutants in soil.



Photo: Vidzeme Planning Region

# PILOT SITES

## Tested methods

One part of INSURE has been to increase the use of sustainable remediation methods. Some different methods have been tested by University of Helsinki on pilot test sites.

### **Motala, Sweden**

Site södra stranden Motala in Sweden is a former oil depot and the soil is contaminated with oil hydrocarbons. The method tested on this site is electro-osmotic biostimulation treatment. The test started in June 2017 and ended in September 2018. Halfway through the test, the results were not showing the expected decrease of the contaminants. Lack of oxygen was presumed to be a limiting

factor and therefore calcium nitrate was used to increase the degradation. By the end of the test the highest concentrations of aliphatic hydrocarbons had decreased approximately 40-70%. But the concentrations were still high in some spots, indicating that the method was not as efficient as expected. If the treatment had been prolonged the concentrations would probably have been lower.



Site Södra stranden Motala. Photo: Motala Municipality



Storage tanks Valmiera, Latvia  
Photo: Magnus Kviele

### **Valmiera, Latvia**

Site territory 9 Dzelzcela Street Valmiera in Latvia is a former storage of heavy fuel oil and place where there was transshipment from rail tanks to road freight transport. There is still black fuel oil left in underground tanks and reservoirs in the area. Soil and groundwater are heavily polluted with oil hydrocarbons. The method used at this test site is electro-kinetic biostimulation. Since the pilot tests were initiated in September 2018 and still ongoing, there are no results to report yet.



Heavy fuel oil. Photo: Magnus Kviele

### **Villädhe/Nastola, Finland**

Site Villädhe/Nastola in Finland is located on an industrial area, within a first-class ground water area. The area is contaminated due to a filling accident of a fuel oil tank in the basement. Part of the contamination is likely to have spread under the building. At this site the method used is biostimulation with electro-kinetic pumping to enable horizontal movement of the injected solution.

The in-situ treatment took 18 weeks in total, with weekly injections of a solution with nitrogen, ammonium and nitrate mixed with water. Before the treatment there was a hotspot with high concentration of oil hydrocarbon. The treatment was successful and there was no hotspot left. The site is now considered clean by an external consultant and no further actions are required.

*Sustainable  
Methods*



Site Villädhe/Nastola. Photo: University of Helsinki

## Other pilot areas

In the project there are more pilot areas: site Janakkala, site Loppi, site Karjaa and site Virrat in Finland and site Gaides iela Vidzeme in Latvia. On these sites the tests are still ongoing and therefore no results can be reported in this brochure.

### **Site Janakkala**

– using treatment with chemical oxidation by injecting hydrogen peroxide, combined with biostimulation

### **Site Loppi**

– testing a method where diluted peroxide is injected into the saturated zone in the ground.

### **Site Karjaa**

– have been remediated before with the method bioflushing, where you are adding nutrients and 0,5 % hydrogen peroxide (as a source of oxygen) into water. Within INSURE the treatment will be enhanced by using cyclodextrin. This has been tested in laboratory scale before.

### **Site Virrat**

– using the method phytoremediation with hybrid aspens.

### **Site Gaides iela**

– recently started



Drilling site Valmiera. Photo: Valmiera City Council



*The four year long project has been a cooperation between partners in Sweden, Finland and Latvia. Various sites and methods have been evaluated and can function as a model for future process.*

*The overall aim is to decrease the distribution of hazardous substances to the Baltic Sea.*

*Through knowledge and cooperation we can achieve sustainable remediations.*

*Curious to know more about the project?  
Check out the link from the code*



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